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ABSTRACT

With the increased use of plastics worldwide the shortage of trained personnel in moldmaking and design for plastic injection molds is becoming critical. Local schools and community colleges should provide courses in mold design and mold making, since most workers presently learn while working under experienced designers on the job. Following this brief background scenario, a planned curriculum for a three-semester program in Moldmaking Design is proposed. Content for each semester is described, and practical suggestions are made for program implemention, covering such topics as facilities, faculty, financing, and reading materials. (The author's address is given for those who wish assistance in starting such a program.) A bibliography is provided. (YLB)

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PLANNING AN INJECTION MOLD DESIGN TRAINING PROGRAM

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ABSTRACT

Planning an Injection Mold Design Training Program.

An informative article on the shortage of trained moldmakers/designers (for plastic injection molds).

The increased use of plastics worldwide is causing the situation to reach the critical stage.

The proposed solution to the personnel shortage includes planned curriculum for a three semester program in Moldmaking Design as well as practical suggestions for program implementation. (facilities, faculty, financing and reading materials)

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PLANNING A PROGRAM TO TRAIN INJECTION MOLD DESIGNERS

Moldmaking/Design is the complex technical skill of designing and creating steel industrial molds for plastic injection machines to produce many of the plastic items we use daily.

The use of plastic is growing faster than all other industrial materials. Ironically the increased use of plastics has come at a time when apprentice and company training programs have been reduced or eliminated. By 1983 the $ value of plastic production will surpass that of all metals combined.* This demand has already caused a shortage of trained personnel in both the machine trade and design areas.

The shortage is presently causing long lead times , higher mold prices and the loss of contracts for understaffed tool shops.

Very few schools teach courses in Moldmaking or Mold Design in North America and most Mold Designers get their training working under a more experienced designer "on the job."

Local schools and community colleges should meet the needs of their respective business communities before offering esoteric and non skill producing courses.

Local industry may have to provide part time instructors but the schools should be asked to provide courses in these needed areas. (Mold Design and Mold Making).

* Ref Career World - Sep. '77

Mold Design I should introduce the student to the injection molding procedure, the mold itself, layout, and the detail drafting of each part.

The basics of the injection molding process should be covered first along with a field trip to a molding plant. Then the actual process of a customer bringing a typical part drawing to the designer should be simulated along with the related problems and solutions of customer satisfaction. Part simplification and a customer information checklist should be added as it might better prepare students for the real world of industry.

The 1st Semester design should be kept simple (no side draft, multiple cavity, or stripper plate molds.) Suggested reference books are listed at the completion of this article.

The student should be guided through the initial layout by covering only one subject per class. (e.g. cooling, gating, ejection).

Because the nature of a design class can often allow the student to delay work until the end of the semester the student should be paced by crediting each night's homework at the beginning of each class.

In a typical design class the lecture should take the first third of the class period. The remaining class time should be allocated for beginning the homework assignment.

After the layout is completed the student should start the detail drawings. An assembly drawing with the associate parts list should complete the Mold Design project. Finally a drawing checklist completes the integrity of the student's semester project.

Syl Contents	Mold Design I	Hours
	Introduction (basic molds)	
	Mold parts and descriptions	2
	Basic mold action	1
	The injection press	1
	Mold hardware	2
	Maximum and minimum daylight	1
	Customer information	1
	Part Design	
	Part simplification	1
	Design parameters	2
	Volume computation	2
	Weight computation	2
	Press selection	1
	Layout and Design	
	Starting view	1
	Front view	2
	Water lines	2
	Parting lines	3
	Inserts	3
	Venting	2
	Core pins	2
	Guide pins, bushings and fits	3
	Support plate	2
	Side parallels and bottom plate	2
	Knock out bar bushings	2
	Ejector system	3
	Press mounting holes and clamp slots	1
	Locating rings and bushings	1

Mold Design II

After the student has completed the basic course in the first semester, more complex molds can be investigated. Multiple cavity and multiple plate molds will introduce the student to the intermediate phase of the subject.

Students should learn the newer techniques of runnerless molding, complex ejection and cooling systems, as well as new products such as heated bushings and sprues.

Deep draw core designs increase students understanding of customer part design problems.

Stripper plate mechanisims allow students to draw multi-phase action drawings of the internal workings of typical industrial molds.

Mold Design II

Introduction (3 plate molds)	
Basic frame design	1
Three plate design movements	3
Runnerless molding	3
Use of standard component parts	3
Product Design	4
Background	
Stripper plate action	4
Deep core plunger technology	2
Hot-runners	2
Insulated runners	2
Hot sprue bushings	2
Undercut runner ejectors	2
Sprue pullers	2
Balancing runners	3
Advanced runner design	2
Deep core and insert design	2
Deep core and insert cooling	1
Cooling baffles	1
Advanced parting lines	3
Ejector systems	5
Valve ejectors	1
Sleeve ejectors	2

Mold Design III

With the student now more proficient in both design and drafting, the advanced portion of the program can be investigated.

Because of their complexity, cam action molds should be covered in the last semester of the program. These include molds with side draw moving parts often mechanically or hydraulically controlled.

Mold Design III

Introduction (cams)	
Product Design Simplification	
Alternative design	3
Multi-unit assembly	2
Technical Background	
Thermal pins	1
Latest cooling systems	1
Parting lines (advanced)	2
Gib design	2
Lubrication	1
Clearances	2
Cam alternatives	2
Ejection problems and solutions with cams	3
Venting	1
Surface finishes (photo-etch etc.)	1
Instrumentation (switches and transducers)	2
Undercut Part Design Problems (layouts)	
Cam pin problems	2
Hydraulic operated core and screw problem	3
Spring operated core problem	1
Mechanically operated screw problem	2
Multiple core problem	2
Curved core problem	2
Screwed core problem	2
Collapsable core problem	2
Loaded insert problem	2
Total:	135 hrs.

Students should be taught to assist the customer by simplifying the part design in order to learn cost reduction.

If time and facilities are available a machine shop should be made available so that students can actually machine at least the basic mold they designed in the first semester. This will give the students a feeling of satisfaction in the application of their own designs/drafting principles to the moldmaking shop.

Very few schools are presently teaching moldmaking/design, even though there is a serious shortage. If more schools and industries would take up this challenge the moldmaking shortage would be alleviated and students and apprentices would graduate with a usable skill and career security.

I'll be glad to assist any teacher, administrator, or mold business in helping to start such programs. Call 413-637-1729 or write me at 9 Sunset St., Lenox, Massachusetts 01240.

Books on Mold Design are scarce, but the few that are available are listed below:

Bibliography

Mold Design I, Basic Steps (A Workbook) - by Allyn
Pub. Allyn Air Publ., Box 576, Lenox, Mass.

Injection Mould Design - by Granwill & Denton
Pub. Industrial Press, N.Y.

Injection Mould Design - by Pye
Pub. Goodwin - Plymouth, England

Injection Mould Design - by Rubin
Pub. S.P.E. Brookfield Center, Conn.

Plastic Mold Design - by Dubois & Pribble
Pub. Reinhold, N.Y.

Associations

S.P.E. - Brookfield Center, Conn.
S.P.I. - Des Plainnes, Ill.